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U.S. PATENT APPLICATION

for

Window Evaporative Cooler

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BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to the field of evaporative coolers, and more particularly to a method and apparatus for installing a low profile evaporative cooler that does not significantly block the window view.

[0002] Evaporative coolers are well know and used in warm dry climates to both raise the humidity and cool the air. Evaporative coolers work by drawing air from outside through a media soaked with water. As the air flows through the soaked media water is evaporated by the outside air thereby lowering the temperature of the air. The cooled air is then directed into the area to be cooled.

[0003] An evaporative cooler includes a number of elements all of which are stored in a housing. These elements typically include an air blower; a media pad; a water distribution system; and an electric motor. Evaporative coolers need to be maintained on a periodic basis to replace the media pads and to clean the water distribution system.

[0004] There are three traditional approaches to mounting evaporative coolers. One approach is to mount the cooler on the roof in which the cooled air is blown down into the building. This type of cooler is also referred to as a down-draft cooler. The roof mounted cooler provides the advantage of being out of the way and can be easily connected to a duct system to deliver the cooled air. However, maintenance of the roof-mounted coolers is difficult due to access. Additionally, many roof mounted coolers are being banned under local zoning ordinances due to the aesthetic nature of the cooler located on the roof.

[0005] Another method of locating evaporative coolers is by hanging the housing from a window or eve. The cooled air is then blown into the area to be cooled through the side of the cooler and is also referred to as a side-draft cooler. The window or eve hung coolers while being more accessible are typically hung from the eves or proximate a window. This approach has a number of disadvantages including blocking the window from use by the cooler. Position of the window minimizes if not completely eliminates the view through the window. Additionally, some local zoning ordinances require do not permit evaporative coolers that extend over the top of the fence line.

[0006] Accordingly, it would be desirable to provide a window evaporative cooler that could be mounted on the ground that would be easy to install and would minimize the amount of the window view that is blocked by the cooler.

SUMMARY OF THE INVENTION

One embodiment relates to an evaporative cooler including a housing having a base, a top, and side walls defining an interior. A fan or blower is positioned within the interior having an outlet for blowing air through an opening in the housing. A duct system includes a first end with a first duct opening that is in fluid communication with the opening in the housing. The duct system also includes a second end located a distance above the top of the housing and having a second opening for directing air into an opening in a building.

[0007] Another embodiment of the invention relates to a method for installing an evaporative cooler in a window located in a building. The window includes at least one movable portion. An evaporative cooler is provided that includes a housing with a vertical height extending from the ground lower than the vertical height of the bottom of the window. A

first portion of a duct is attached to the housing. A frame is placed between the movable portion of the window and the building. A second portion of the duct is secured to the frame; and operatively secured to the frame between the movable portion of the window and the building.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a front perspective window evaporative cooler for use in a standard horizontal window portions.

[0009] FIG. 2 is a view of the low profile duct located in the window evaporative cooler of FIG. 1.

[0010] FIG. 3 is a front perspective view of a window evaporative cooler for use with a vertical style sliding window.

[0011] FIG. 4 is a perspective view of the evaporative cooler partially assembled.

[0012] FIG. 5 is a perspective view of the evaporative cooler with the duct system in a first collapsed position.

[0013] FIG. 6 is a perspective view of the lower duct.

[0014] FIG. 7 is a perspective view of the intermediate duct.

[0015] FIG. 8 is a perspective view of the upper duct.

[0016] FIG. 9 is a rear perspective view of a horizontal guide.

[0017] FIG. 10 is a rear perspective view of a vertical guide.

[0018] FIG. 11 is a rear plate of the lower portion of the vertical diverter of the window evaporative cooler of FIG. 3.

[0019] FIG. 12 is a view of the adjustable frame from within the building looking outward.

[0020] FIG. 13 is a perspective view of the interface of two sections of the adjustable frame of FIG. 12.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Referring to FIGS. 1 - 3, a window evaporative cooler 10 includes a housing 12, a telescoping duct system 14 and a grill system 16. Housing 12 may be located directly on the ground, or may be supported on feet 18 or any standard support to ensure that the housing is in a horizontal position. Housing 12 stores a pump (not shown) for pumping water through a flexible or rigid media (not shown). A fan 19 draws outside air into housing 12, through the wetted media and is blown upward through an opening 22 in a top panel 24 of housing 12.

[0022] Referring to FIG. 4, extending upward from top panel 24 of housing 12 and surrounding opening 22 are flanges 26. Opening 22 is located proximate the rear panel or side 28 of housing 12. For description purposes, the rear panel of housing 12 is the portion that is adjacent or facing the outside of the building. Accordingly, front side 30 of housing is the panel. A screen 32 is located adjacent opening 22 between flanges 26 and rear panel 28.

[0023] Telescoping duct system 14 extends from opening 22 of housing 12 to grill system 16 and channels the cooled air from housing 12 through an opening in a window of building. In one embodiment, telescoping duct system includes a lower duct 34, an intermediate duct 36 and an upper duct 38. Referring to FIGS. 5 and 6, lower duct 34 includes a rear panel 40, a front panel 42 and a pair of side panels 44, 46. Lower duct 34 has an upper edge 48 with an outwardly extending flange 50. Rear panel 40 of lower duct 34 has lower edge 52. The distance of lower edge 52 is further from upper edge 48 than the lower edges 54 of the other panels of lower duct 34. The lower edge 52 of rear panel 40 extends beyond top panel 24 and is secured to rear panel 28. In contrast lower edges 54 of panels 42, 44 and 46 are located proximate top panel 24. The upwardly extending portion of flanges 26

extend within lower duct 34. L-shaped brackets 56 are secured to the lower portions of lower duct 34 to support intermediate duct 36.

[0024] Referring to FIG. 7 intermediate duct 36 includes four side panels having an upper edge 58 and a lower edge 60. A flange 62 extends inwardly from lower edge 60. As intermediate duct 36 is raised relative to lower duct 34, flange 62 will contact outwardly extending flange 50 thereby prohibiting the intermediate duct 36 and lower duct 34 from separating from one another. Intermediate duct 36 also includes an outwardly extending flange 64 extending about its upper edge 58.

[0025] Referring to FIG. 8 upper duct 38 includes a lower edge 66 having a flange 68 extending inwardly there from on all four sides of upper duct 38. Referring to FIG. 5 lower, intermediate and upper ducts 34, 36 and 38 are telescopingly engaged such that they can be expanded relative to one another to accommodate varying distances to provide an adjustable duct length for varying window heights and terrain conditions.

[0026] Upper duct 38 has a cross sectional area that is greater than the cross sectional area of intermediate duct 36, which in turn has a greater cross sectional area than lower duct 34. In this way, upper duct 38 fits over intermediate duct 36 which fits over lower duct 34 so that any rain or outside dust will not be able to enter housing 12 through the space between the ducts and enter housing 12. When intermediate and upper ducts 36, 38 is fully extended relative to lower duct 34 lower flange 52 of intermediate duct is in contact with upper flange 50 of lower duct. Similarly, when upper duct 38 is fully extended relative to intermediate duct 36, lower flange 68 of upper duct 38 is in contact with upper flange 64 of intermediate duct 36. In this manner, the ducts will not separate from one another during installation of the duct system with the grill in the window of the building.

[0027] Depending on whether the window through which the duct will attach is an up/down horizontal type window illustrated in FIG. 1 or a side to side vertical window illustrated in FIG. 3, a horizontal diverter 70 or vertical diverter 72 is secured to upper duct 38 proximate its upper edge 74. Referring to FIG. 9 horizontal diverter 70 includes a bottom panel 76 having an opening 78 with downwardly extending flanges 80. Referring to FIG. 1, upper edge 74 of upper duct 38 is located within opening 78. Flanges 80 surround the outer surface of upper duct 38 proximate its upper edge 74. Extending upwardly at an angle of 109 degrees from a rear side of diverter 70 is an angled panel 84. Front edge 86 of angled panel 84 is located 4.5 inches above the top edge 74 of upper duct 38. A pair of side walls 88 extend between angled panel 84 and bottom panel 76. Extending from rear edges 90 of angled panel 84 and side walls 88 is a rectangular extension member 92 extending rearwardly there from to be located through an window opening of the building. Rectangular extension 92 includes a free end from which a grill may be attached. In a preferred embodiment, rectangular extension 92 is 18 inches wide and 4.5 inches high. This low height blocks a minimal portion of the window. In a preferred embodiment, opening 22 in housing 12 is centrally located. Similarly, duct system 14 is also centrally located. Further since horizontal diverter 70 is also centrally located, the evaporative cooler housing 12 will be located directly below the window opening through which extension 92 extends. As a result evaporative cooler 10 is centrally located below horizontal diverter 70

[0028] Referring to FIGS. 3 and 10 vertical diverter 72 will be described in greater detail. When the window is a vertical window that slides side to side, the opening provided by the window is also vertical. If a horizontal extension is to be used, the window must be moved sideways the complete width of the horizontal extension. The use of a vertical

diverter 72 and extension permits the window to be opened only a small amount. (Vertical diverter 72 includes a base 94 and a vertical extension 96. Base 94 includes a lower portion 98 and an upper portion 100 directing the flow of air from duct system 14 to vertical extension 96.

[0029] Lower portion 98 includes four downwardly extending flanges 102 that extend over upper edge 74 of upper duct 38. Three sloping panels 104 converge inward and rearward toward extension 96. A fourth rear panel 106 extends upwardly and includes an opening 108 in fluid communication with vertical extension 96. Upper portion 100 includes a front panel 110 extending upwardly and rearwardly from lower portion 98 to an upper edge 112 of vertical extension 96. Two side panels 114 extend upwardly from lower portion intermediate front panel 110 and vertical extension 96.

[0030] In this manner the opening 22 of 11 7/8 inches by 9 7/8 inches is redirected to the vertical extension having a height 118 of 18 inches and a width 120 of 4.5 inches. A section plate 116 is positional within vertical extension 96 to distribute air along the entire height 118 of vertical extension 96

[0031] Referring to FIGS. 3 and 12, frame 122 includes a first portion 124 and a second portion 126 slidably received within first portion 124. First portion 124 includes a fist wall 126 having an first longitudinal edge 128 and a second longitudinal edge 130. Extending perpendicular to first wall 126 intermediate first and second longitudinal edges 128, 130 is a second panel 132. A first plastic panel support region 134 is defined by first portion 124 and a first upstanding longitudinal member 136 parallel to first portion 124. Second panel 132 further includes a second track receiving region 140 defined by the area between upstanding longitudinal member 136 and a second upstanding longitudinal member 142. Finally, a third longitudinal member 144 is located proximate an edge 146 of

second plate 132 distal first wall 126. Both longitudinal members 142 and 144 have a top flange 146, 148 extending toward one another a predetermined distance. In the preferred there is a gap between the free ends of top flanges 146, 148.

[0032] First portion 124 is slidably received in second portion 126. Second portion 126 includes a first panel 150 and a second panel 152 extending from and substantially perpendicular to first panel 150. Second panel 152 includes a pair of upstanding longitudinal members 154, 156 that are slidably received in second track region 140 of first portion 124. Both longitudinal members 154, 156 have flanges 158, 160 extending from the free ends thereof and facing one another. Further, second panel 152 includes an end longitudinal member 162. A track 164 is defined between end longitudinal member 162 and longitudinal member 156. Longitudinal members 142, 144 of first portion 124 is received within track 164 of second portion 126.

[0033] Referring to FIGS. Flanges 150 and 128 are located adjacent the edge of the window to be closed and the sill, such that channel 134 faces inward toward another leg of frame 122. First portion 124 includes two parallel legs or segments 166, 168 and a short leg or segment 170 extending between the two parallel legs 166, 168. Similarly, second portion 126 includes a pair of parallel legs 172, 174 and a short leg 176 extending there between.

[0034] Figure 12 is viewed as a person looking at frame 122 from the inside of the building. If frame 122 of FIG. 12 is located in the window shown in FIG. 3 then the leading edge of the window will be adjacent surface 178 of portion 132 of leg 168 while the inside surface of the window will be adjacent surfaces 180 and 182 of members 126 and 150 of legs 168 and 174. Similarly, legs 166 and 172 are adjacent the window frame. In this manner the channel 134 of each of legs 166 and

168 face inward and form a groove to receive a clear piece of plastic or glass 178. Top portion 170 may be removed to slide the plastic or glass piece into place and then replaced to complete the frame.

[0035] Frame 122 may also be used in the horizontal widow configuration illustrated in FIG. 1. In this embodiment legs 166, 168, 172 and 174 are arranged horizontally, while legs 170 and 176 are arranged vertically. Legs and 166 and 172 may be removed from vertical legs 170 and 176 to slide the plastic or glass within the frame. Legs 166 and 172 may then be secured to vertical legs 170 and 176 to complete the frame 122. After which the horizontal window is moved downward capturing horizontal extension 70 and frame 122. As noted above, in this embodiment, the evaporative cooler housing 12 is completely out of view of the window and only five inches of the bottom portion of the window is blocked by the extension member 70. Further, if the window is wider then extension member 70, this portion of the frame is filled with a clear plastic or glass or other material and is therefore not blocked at all.

[0036] A controller unit may be located within the opening of extension member 70 or 72 to allow a user to operate evaporative cooler 10. The controller may be hard wired or may communicate with evaporative cooler 10 by wireless transmission. However, if the receiver is located in housing 12, a remote transmitter may not have sufficient strength to be received in housing 12, since it is not in the line of sight from within the building. In such case controller 180 will have to be in wired communication with the control unit within housing 12. Extension 70 may also include louvers or a covering to cover the opening. Extension 70 and 72 include flanges 184, 186 respectively that a grill or cover 188 may be attached to.

[0037] In another embodiment, an evaporative cooler may include adjustable legs that permit the housing to be raised proximate the window

sill. In this embodiment, the opening proximate the blower could be in the rear panel of the housing adjacent the building. A duct could extend directly from the rear portion of the housing directly into a window opening with or without a diverter. A diverter could be used to narrow the opening in the housing to the narrow rectangular shape discussed above with the horizontal and vertical diverters. Alternatively, the opening in the top of the housing could remain as in FIG. 1, but the duct need not be adjustable since, the housing could be raised to the position allowing a fixed duct to be placed the window opening. The benefit of keeping the window view clear of the housing could still be obtained without the need for an adjustable duct assembly. The use of a diverter and adjustable duct assembly may also be used with a housing having adjustable legs.

[0038] The installation and assembly of the evaporative cooler 10 will be described. The evaporative cooler housing 12 is positioned on the ground in front of a window of a building. Housing 12 may be positioned directly on the ground or it may be raised off of the ground on legs 18. Legs 18 may be adjusted to level the housing if the ground itself is not level. Additionally, legs 18 may be extendable so that the position of housing 12 relative to the ground and window can be set. It is possible to position the housing 12 such that the top of housing 12 is adjacent the bottom portion of the window. Alternatively, housing 12 may be positioned such that the top of the housing 12 is located a set distance above the window sill. In this location it is possible to provide an opening in the side of the housing or back of the housing proximate the top of the housing with a duct that extends directly into a space between a movable portion of the window and the window sill with a horizontal window or between the movable portion of the window and window frame or building for a vertical window.

[0039] In the embodiment illustrated in FIGS. 1 and 3, a duct assembly 14 is secured to opening 22 in top 24 of housing 12 by attaching the lower duct portion 34 to flange 26. A horizontal diverter 70 or vertical 72 is attached to the top of upper duct 38 for use with a horizontal window or vertical window as illustrated in FIGS. 1 and 3 respectively. Referring to the installation of the evaporative cooler 10 for a horizontal window frame 122 is located within an opening defined by the bottom of the movable portion of the window and the window sill such that legs 174 and 168 are adjacent the window sill. Legs 126 and 124 are removed from legs 170, 176. Legs 174 and 168 are slide relative to one another such that legs 170 and 176 are adjacent the sides of the window. Extension portion of diverter 70 is placed within frame 122. If the width of the frame is greater than the width of the extension portion, then a clear member such as glass or plastic is cut to size to fill in the empty or open area between legs 170 and 176. Once the extension portion and clear member is positioned within frame 122, legs 126 and 124 are secured to legs 176 and 170, completing the frame. The horizontal window is then moved downward such that the bottom portion of the window contacts frame 122 and secures frame 122, the extension portion and clear member in place.

[0040] As the diverter and extension member are put in place, intermediate and upper ducts 36, 38 are moved relative to one another and lower duct 34 to fill the space between the housing 12 and the window opening. Other type of expandable ducts may be used including flexible or corrugated type ducts. The adjustable duct minimizes installation since, a duct does not need to be cut to size for installation. Further if desired, the duct may be collapsed during the time when the evaporative cooler is not in use.

[0041] It is important to note that the construction and arrangement of the elements of the window evaporative cooling system as described is illustrative only. Although only the few embodiments, the present invention has been described in detail in this disclosure, those skilled in the art who review this disclosure will verily appreciate that many modifications are possible (example: variations in sizes, dimensions, structures, shapes and proportions of the various elements, values and parameters, mounting arrangements, use of materials, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter disclosed herein. Accordingly, all such modifications are intended to be included within the scope of the present invention. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes and omissions may be made in the design, operating conditions and arrangement of the preferred and other exemplary embodiments without departing from the spirit of the present invention.